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Grid Integrated Multi Megawatt High Pressure Alkaline Electrolysers for Energy Applications: ELYntegration

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Foundation for the Development of New
Hydrogen Technologies in Aragon (Spain)

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The Project

- Started: September 2015
- Duration 36 months (September 2018)
- The strategic goal of ELYNTEGRATION is the design and engineering of a
 - robust, flexible and cost competitive
 - Multi Megawatt alkaline water electrolyser
 - capable of producing - with a single stack - up to 4.5 ton H₂/day for energy applications.

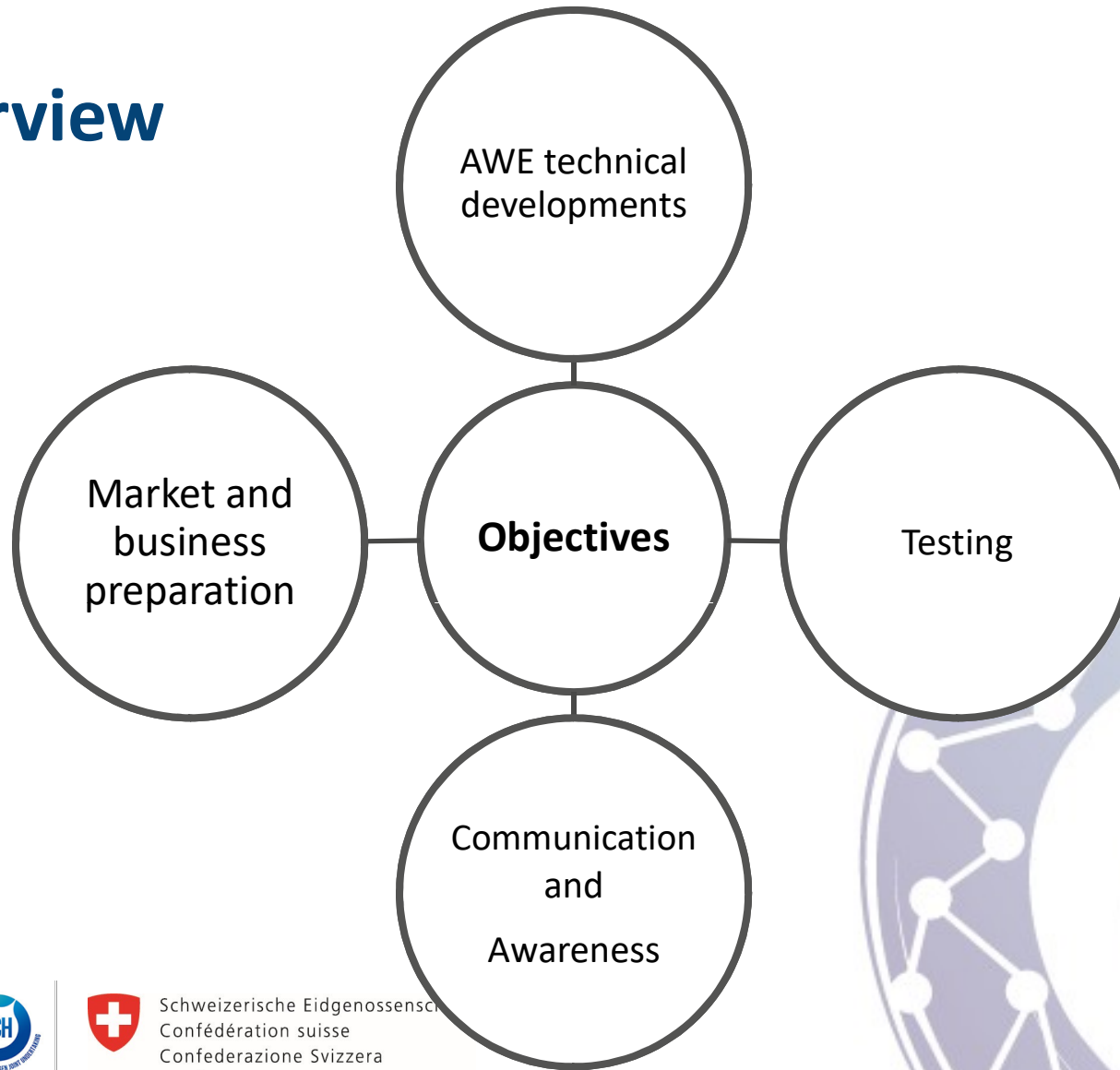


The Consortium

- FHA (Fundación Hidrógeno Aragón, Coordinator, ES)
- IHT (CH)
- VITO (BE)
- Fraunhofer-IFAM (DE)
- Inycom (ES)
- IAEW-RWTH Aachen (DE)



Overview



Alkaline Water Electrolysis

- Cell design and improvements at stack level → high performance in a broad range of the electrolyser load.
 - Material development (electrodes , membranes)
 - Topology and assembly of the final stack solutions
- Definition and design of an optimized balance of plant (BoP) for the dynamic operation.
 - Analysis of the BoP components and streams which could derive in lower costs of the system
 - Participation of industrial and technological partners
- Advanced communication and control system
 - Requirements of end-users
 - Enhance the flexibility of the electrolyser providing grid services



Testing

- Tested step by step and continuously during the project:
 - from ex-situ characterization at laboratory level
 - to in-situ testing at different scales (micro pilot to industrial size)
- The most promising results obtained in the project will be included in a final validation electrolyser working in an operational environment.
- Once validated and demonstrated at prototype level, the advanced constructive features will be integrated in the design of a multi-MW single stack alkaline electrolyser.



Market and business preparation

- Feasibility study and market potential assessment
 - determine the best possible markets, sectors and countries for the final product
- The market study focuses on the national policies towards **renewable energy and energy storage**, with special attention to electricity prices in the power market and the provision of grid services to minimize the price of the hydrogen production.
- Exploitation strategy and **business plan**: After the results of the demonstration activities, the conclusions of the market study and the analysis of different business cases
- The exploitation strategy and business model for the ELYntegration final product will be presented to the hydrogen community of the EU and different stakeholders like TSOs, DSOs, utilities, grid operators, etc. in workshops and events during the project progress.



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Status

Month 26

Additional services and business models: identified

Communication and control systems to provide services

New membranes and electrodes developed tested @ lab

New materials tested in situ at intermediate scale

Pilot scale tests and industrial scale - ongoing

Communication activities ongoing (web, conferences,...)



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Communication and Awareness

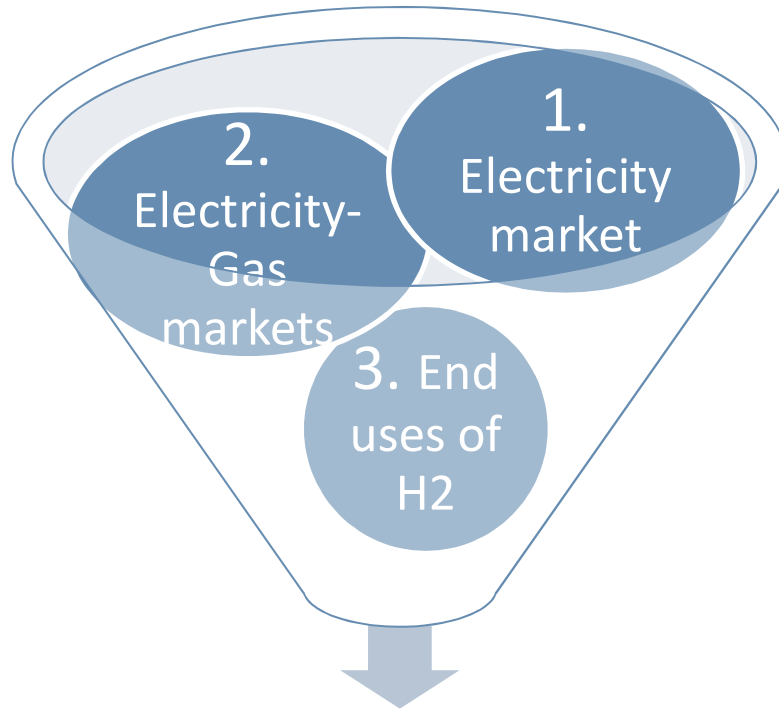
- Activities complementary to the exploitation strategy and business plan.
- Targets: policy makers, local authorities, technology providers, general public.
- The final goal is to develop awareness of the services and technology to be demonstrated in the project at each level, including energy transition problematic, grid flexibility and environmental aspects.
- Channels: website, leaflets, participation in specialized conferences and fairs.
- Public deliverables will be also published and available in the project's webpage.



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1st Elyntegration Workshop



**Hydrogen applications
and end users**



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1st Elyntegration Workshop

Pannel 1. Electricity market

Understanding the actual and future paradigm of electricity and power market, achieving an affordable, decarbonized and secure electricity supply

Pannel 2. Electricity-Gas markets

As one of the potential solutions, Power to Hydrogen and Power to Gas. Status and prospects, challenges, potential needs in terms of regulation, codes, and standards that are encountered.

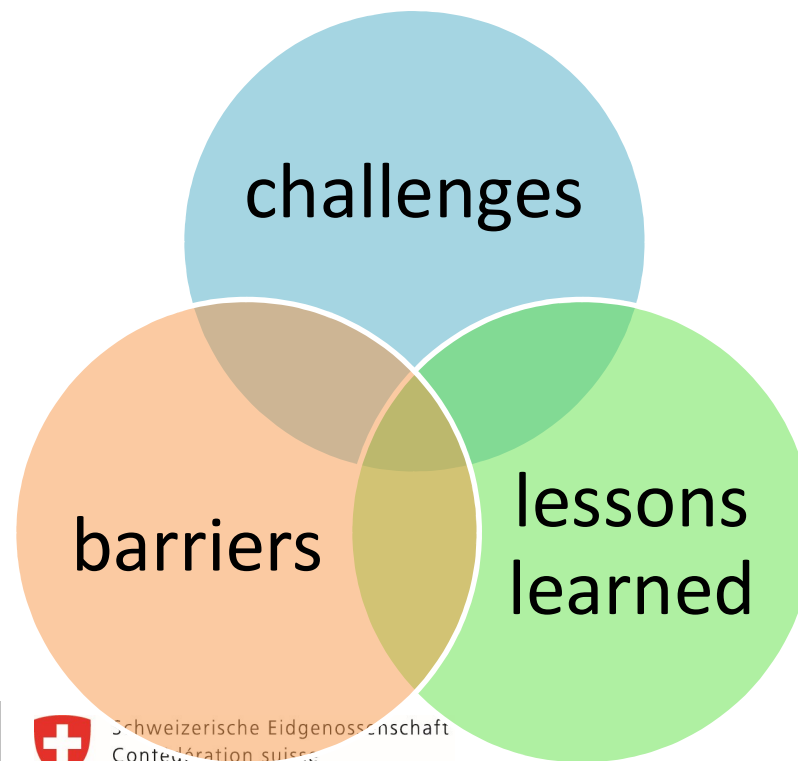
Pannel 3. End uses of H₂

How green hydrogen could empower the use on industrial and mobility markets and new market segments



Objectives

Providing spectra of applications and interrelations to the potential end-users



Working on key intermediate objectives

1. Challenges that electrolysis is meeting in EU?

- from the point of view of electricity integration and grid services
- from the point of view of applications

2. Are there specific non-technical barriers ?

Based on experience from attendants and speakers (other projects) e.g regulations, codes

3. The most critical aspects for the operator?

Technical [maintenance, training, connectivity, integration in other processes – rest of the plant] // Non-technical [public perception, standards] //Economical

4. Are there means to overcome the barriers and challenges?

5. Is it possible to elaborate on additional recommendations to facilitate the integration of electrolysers as link between electricity and gas markets?

6. Next steps: what improvements are needed?

Methodology

- The attendants will elaborate on the discussion and feedback received during the workshop towards obtaining the workshop conclusions, to be also implemented during the project's final year communication activities, including a following seminar focused on a scientific/technology discussion
- Work in groups

<https://pollev.com/elyntegratio749>



Agenda

- 10.30 – 11.30 Session 1. Electricity Market
 - Mr Guillermo Matute (Technology transfer, Inycom) - **Chairman**
 - Dr Raquel Garde (Energy Storage Area Manager, CENER)
- 11.30 – 12.00 Networking Coffee
- 12.00 – 13.30 Session 2. Electricity-Gas markets
 - Mr Jesús Simon (Head of Technical Dpto., Hydrogen Foundation of Aragon) - **Chairman**
 - Mr Jose A. Lana Calvo (Head of Technology and Innovation, Enagas)
 - Ms Tineke Bolhius (Business Developer, Gasunie)
 - Dr Luis M. Romeo (Dpt. Mechanical Eng., Univ. Zaragoza)



Agenda

- 13.30 – 15.00 Lunch and Networking
- 15.00 – 16.00 Session 3. End uses of Hydrogen
 - Ms Esther Albertin (CEO, Sface) - **Chairman**
 - Dr. Jaime Soler (Dpt. Chemical and Environmental Eng., Univ. Zaragoza)
 - Mr Diego Embid (Project engineer, IHT)
- 16.00 – 16.30 Working groups
Closing remarks





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Thank you for your attention

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Highlights

- Session 1:
- TSO (greatest potential – electrolysis)
- DSO – aggregators (Must be more active, key role)
- Regulations/codes to boost the market → needed

Session 2

Main switch is needed

Business case is still challenging

P2methane is better than P2H (not from the market business point of view but yes about the costs)

H2 → potential → future backbone networks



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Highlights

- Session 3:
- PtL → possibilities are on place but....industrial sue
- Competing to SMR prices (no business right now depending on:

Electricity prices/CO2 costs

